

Oral and systemic factors in xerostomia

Relação de xerostomia com fatores bucais e sistêmicos

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ABSTRACT

Objective: The aim of this study was to evaluate the relationship among the following features: hyposalivation, systemic diseases and drug use, oral symptoms, dental condition, salivary flow and salivary pH, as well. **Methods:** A cross-sectional study was performed with 50 participants diagnosed with xerostomia, randomly selected and distributed in two groups: 25 with hyposalivation and 25 without hyposalivation, paired in age and sex. Unstimulated Salivary Flow Rate (USFR), Decayed, Missing, Filled, Teeth (DMFT) index and salivary pH were determined. The Mann-Whitney test and chi-square test were applied, considering significant for p -values <0.05 . **Results:** Among the participants with hyposalivation, 88% used drugs and 96% presented systemic disease. And among those without hyposalivation, 48% used drugs and 64% presented systemic disease. The ones with hyposalivation showed the highest levels of dysgeusia (60%) and burn mouth (36%). There were statistically significant differences for the medians of USFR (0.08ml/minute / 0.2ml/minute) ($p = 0.000$), pH (6/7) ($p = 0.000$) and DMFT (22/17) ($p = 0.004$) obtained from participants with hyposalivation and without hyposalivation, respectively. Only in the group with hyposalivation there was a statistically significant association of unstimulated salivary flow rate with age ($p = 0.035$), type of systemic disease ($p = 0.049$) and pH ($p=0.032$) and DMFT demonstrated an association with systemic diseases ($p = 0.015$). **Conclusion:** The research results have suggested that hyposalivation worsens dental status triggering oral symptoms, and that salivary flow is influenced by the type of systemic disease and age group.

Indexing terms: Saliva. Oral health. Xerostomia.

RESUMO

Objetivos: Avaliar a relação entre hipossalivação, doenças sistêmicas e uso de medicamentos, sintomas bucais, experiência com cárie, fluxo e pH salivar. **Métodos:** Realizou-se estudo transversal com 50 participantes com xerostomia, selecionados e distribuídos aleatoriamente em dois grupos: 25 com hipossalivação e 25 sem hipossalivação, pareados em idade e sexo. Determinou-se o fluxo salivar em repouso (FSR), índice de dentes cariados, perdidos e obturados (CPO-D) e pH salivar. Aplicou-se teste de Mann-Whitney e teste qui-quadrado, considerando significantes valores de $p<0,05$. **Resultados:** No grupo de participantes com hipossalivação 88% usavam medicamentos e 96% tinham doença sistêmica e, entre os sem hipossalivação, 48% usavam medicamentos e 64% tinham doenças sistêmicas. Aqueles com hipossalivação tiveram os maiores percentuais de disgeusia (60%) e ardor bucal (36%). Houve

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How to cite this article

Soares MSM, Cavalcanti RL, Gonçalves LFF, Assis IO. Relação de xerostomia com fatores bucais e sistêmicos. RGO, Rev Gaúch Odontol. 2021;69:e20210037. <http://dx.doi.org/10.1590/1981-863720200003720200071>

diferenças estatisticamente significantes para as medianas de FSR (0,08 ml/minuto / 0,2 ml/minuto) ($p=0,000$), pH (6/7) ($p=0,000$) e CPO-D (22/17) ($p=0,004$) obtidas dos participantes com hipossalivação e sem hipossalivação, respectivamente. Apenas no grupo com hipossalivação houve associação estatisticamente significante do fluxo salivar em repouso com faixa etária ($p=0,035$), tipo de doença sistêmica ($p=0,049$) e pH ($p=0,032$) e, o CPO-D teve associação com doenças sistêmicas ($p=0,015$). **Conclusão:** Os resultados sugerem que a hipossalivação piora a condição dental, favorece a presença de sintomas bucais e, o fluxo salivar em repouso sofre influência de doenças sistêmicas e faixa etária.

Termos de indexação: Saliva. Saúde bucal. Xerostomia.

INTRODUCTION

Saliva plays an important role in homeostasis and oral health. The reduction in salivary flow is a risk factor for oral diseases, and may increase the predisposition to symptoms such as dry mouth, dysgeusia, burning mouth and dysphagia, as well as provoke intolerance to acidic foods and condiments, and negatively interfere with life quality [1-9]. Both xerostomia and hyposalivation etiology present several local and systemic risk factors [10] which are as following: the side effects of medications, systemic diseases and radiotherapy of the head and neck [2,7,11], as well, aging, female patients and the number of teeth in the oral cavity [12-15] are also identified as possible causes of reduced levels of salivary production. Xerostomia does not always come with salivary flow reduction or hyposalivation [15,16] and their risk factors are believed to have a multidimensional relationship that is not fully understood [16]. Taking in consideration that these two oral conditions have been increasing in the population [7], do not present specific effective treatment [17,18] and that their risk factors probably develop unknown interrelationships, the present study aimed to evaluate the relationship among the following issues: hyposalivation, presence of oral symptoms, dental condition, salivary flow and pH, systemic diseases and medication use in individuals presenting xerostomia complaints.

METHODS

Study design and sample

A cross-sectional study was carried out with adult individuals, of both sexes who sought treatment for xerostomia in a public dental service. The sample consisted of 50 participants with xerostomia symptoms regardless of etiology, selected and randomly divided into two groups: 25 individuals with hyposalivation and 25 individuals without hyposalivation, paired in age and sex. Inclusion criteria

for the hyposalivation group was resting salivary flow equal to or less than 0.1ml/minute and for the group without hyposalivation the inclusion criteria was a resting salivary flow rate equal to or greater than 0.2ml/minutes. Patients' anamnesis was performed and data regarding age, sex, systemic diseases, use of medications, oral symptoms such as burning mouth and dysgeusia were collected, as well as saliva collection. The salivary pH was determined and the experience with caries was recorded through the DMFT index. All procedures were performed by a dentist single examiner. The study protocol was approved by the Human Research Ethics Committee of the Health Sciences Center of Federal University of Paraíba (No. 0086/13). Written consent was obtained from all participants.

Diagnosis of hyposalivation

Salivary flow sialometry at rest (SFR) was performed in order to diagnose hyposalivation. The patient was asked to sit at a 90° angle, with his head down, and to remain without swallowing, speaking or moving his tongue, for one minute. Then, it was requested that all accumulated saliva be expelled in a graduated test tube. The procedure was repeated five times at every one minute. For the final reading, the foam was disregarded and the total salivary volume obtained was divided by 5 (salivary collection time), obtaining the SFR in ml/minute. Hyposalivation was considered when the SFR was ≤ 0.1 ml/minute.

DMFT index and salivary pH

Dental caries experience was evaluated by the DMFT index corresponding to the average of teeth, decayed, lost and filled, and the final result was obtained through clinical examination, with the aid of a probe, mirror and adequate lighting. In order to determine salivary pH, a colorimetric method was used with the Dentobuff® Strip test, which, according to the manufacturer's guidelines, placed a drop of saliva on the surface of a sample strip pad and after five

minutes, the pH reading was performed, considering the changing color of the strip and comparing it with a pH colorimetric scale provided by the manufacturer. The scale classifies saliva with the following pH ranges: 4.5 to 5.75 (very acidic), 6 to 6.5 (acidic), 6.75 to 7.25 (neutral) and 7.5 to 9 (very alkaline).

Statistical analysis

The data obtained were tabulated using the SPSS program (Statistical Package for Social Science, Chicago, ILL), version 14.0 for WINDOWS, with a descriptive analysis and a Komogorov-Smirnov normality test. To compare the differences between the groups, the Mann-Whitney test was applied with the variables SFR, pH and DMFT and, to assess association, the chi-square test was used, considering significant values of $p < 0.05$.

RESULTS

The demographic and health-related characteristics of the participants are shown in table 1. It was observed a predominance of female participants and also that the majority of participants were under 60 years of age, in both groups. The highest percentage found among participants with hyposalivation and the most prevalent systemic diseases were: cardiovascular 36% (9), psychological

8% (2), oral cancer 8% (2) and gastrointestinal 8% (2). While in the group without hyposalivation the following were more prevalent: hypercholesterolemia 12% (3), cardiovascular diseases 8% (2), gastrointestinal diseases 8% (2) and osteoporosis 8% (2). It has also been observed that among individuals with hyposalivation the majority had taken medication, mainly antihypertensive drugs 36% (9) and psychotropic drugs 8% (2). In the group without hyposalivation, there was a lower percentage of medication use and the most consumed drugs were antihypertensive, anti-lipid, anti-ulcer and bisphosphonates with 8% (2) each. Participants with hyposalivation demonstrated a higher frequency of oral burning and dysgeusia than those without hyposalivation. Table 2 demonstrates that the participants with hyposalivation showed the salivary flow median at lower rest when compared to the group without hyposalivation, a statistically significant difference ($p = 0,000$). As for salivary pH, in the group with hyposalivation, the median value was 6, with 56% (14) of individuals pH 6; 16% (4) at pH 5 and 28% (7) at pH 7. It is observed that 72% presented an acidic or very acidic pH. While in the group without hyposalivation, the pH showed a median of 7,9% (24) with pH 7 and only 4% pH 6, that is, only 4% of the participants presented acid pH. The differences were statistically significant ($p = 0.000$). It is also observed that the median of the DMFT between participants with hyposalivation was higher than that of the group without hyposalivation, with a statistically significant difference

Table 1. Demographic and health-related characteristics of the study participants.

Variables	Group with hyposalivation n=25		Group without hyposalivation n=25	
	50 (29 – 67)		47 (25 – 64)	
Age (median)	n	%	n	%
Age range				
29–39	4	16	5	20
40–49	6	24	7	28
50–59	6	24	5	20
60+	9	36	8	32
Sex				
Male	5	20	5	20
Female	20	80	20	80
Systemic disease	24	96	16	64
Drug use	22	88	12	48
Oral Symptoms				
Burning mouth	9	36	1	4
Dysgeusia	15	60	4	16

Table 2. Sample distribution of salivary flow at rest, DMFT and pH, differences between the groups studied.

Value	Group with hyposalivation	Group without hyposalivation	pH value
Variable	Median (Minimum – Maximum)	Median (Minimum – Maximum)	
SFR	0.08 (0.00 – 0.10)	0.20 (0.12 – 0.80)	0.000*
DMFT	22 (12 – 28)	17 (6 – 26)	0.004*
pH	6 (5 – 7)	7,9 (6 – 7)	0.000*

Note: * Statistically significant. DMFT: *Decayed, Missing, Filled, Teeth*; SFR: Salivar Flow at Rest ml/minute; pH:

($p = 0.004$). Only in the group with hyposalivation there was a statistically significant association between salivary flow at rest and the following variables: age group ($p = 0.035$), type of systemic disease ($p = 0.049$) and pH ($p = 0.032$). Regarding the systemic disease variable a statistically significant association with DMFT ($p = 0.015$) was observed.

DISCUSSION

Comparing the results of the two groups studied, a higher frequency of systemic diseases and medication consumption can be evident among participants with hyposalivation. This finding reinforces the results of studies indicating that drugs and systemic diseases are important probable etiological factors for dysfunction of the salivary glands [2,7,10,16]. The types of medication most consumed by hyposalivation participants were antihypertensive and psychotropic drugs. In the literature these drugs are considered xerostomics [2,16,19,20]. An association of salivary flow at rest with systemic diseases was also observed ($p = 0,015$) in agreement with another study, in which the authors believe to be a complex and multidimensional relationship of the factors involved in the etiology of xerostomia and hyposalivation [16]. There is evidence that the medication use increases the risk for xerostomia and hyposalivation. Generally, drugs cause hyposalivation through the impact on central and peripheral receptors, resulting in anticholinergic activity against M3 muscarinic receptors [21]. Several authors claim that the prevalence of xerostomia and hyposalivation increases in individuals who consume polypharmaceuticals [2,22] and, it is believed that the medication consumption is more predictive of the risk for hyposalivation than other factors such as age or sex [21].

Participants with hyposalivation showed higher percentages of oral burning and dysgeusia than those without hyposalivation, which corroborates other studies

in which the presence of these symptoms was also reported more frequently among individuals with reduced salivary flow [3,6,23]. A possible justification for the findings of the present study would be that the reduction of the salivary flow and the qualitative alteration of the saliva can modify the response of receptors present in the taste buds of the oral mucosa of these individuals, impairing and/or altering the gustatory perception. Evidence has shown that the presence of systemic diseases and/or the medication use can cause oral symptoms such as burning mouth and dysgeusia. Nonetheless mouth burning is related to both conditions, while dysgeusia is more common with the use of certain drugs, such as psychotics [23]. In the present study, the frequency of dysgeusia was higher among individuals with hyposalivation (60%) and the use of psychotropic drugs was reported only among individuals in this group. Saliva plays an essential role in detecting the taste of foods [24,25], since it takes places in processes such as: solubilization of substances, chemical interaction between salivary components and taste substances, and diffusion and dilution of substances in saliva. Moreover, saliva has components which stimulate taste receptors, as well as it plays a role in protecting the oral mucosa and maintaining the receptors. Therefore it we can be assumed that regarding hyposalivation, salivary changes can influence the distorted perception of flavors and alter the sensitivity of the oral mucosa [25,26], causing dysgeusia and/or oral burning. The hyposalivation group showed a statistically significant association between the salivary flow at rest and the age group. A similar result was observed in other studies [7,12,15]. The authors believe that this finding is due to the increased consumption of medication, especially with polypharmaceuticals, as the individual's age increases [27]. Xerostomic drugs can modify the relationship between saliva and dental caries, considering that they cause a reduction in salivary flow, leading to a greater accumulation of dental biofilm and a reduction in the buffering action, favoring the caries. In addition, patients with dry mouth sensation generally

report consuming sweets and acidic foods in order to relieve their symptoms, which contributes to increasing the risk of dental demineralization. Because these two conditions occur simultaneously, there is an imbalance in the remineralization-demineralization process, consequently resulting in carious lesions [28]. Hyposalivation and reduced flow can increase the risk for caries [29]. An association between hyposalivation and the number of teeth in the mouth has also been demonstrated, suggesting that having less than 20 teeth in the oral cavity increases the risk of hyposalivation [14,15]. This data corroborates the result of the present study in which the dental condition of the participants (DMFT) with hyposalivation was worse than that of those without hyposalivation, with $p = 0.004$. The resting salivary flow of participants with hyposalivation showed a statistically significant association with salivary pH. This data is in agreement with the result of another study in which a relationship was observed between the frequency and severity of caries with salivary pH [30].

CONCLUSION

The research results have suggested that the presence of hyposalivation worsens the dental condition, favors the presence of oral symptoms as well that the salivary flow at rest is influenced by systemic diseases and age group. Further studies are suggested for multidimensional analysis of factors associated with xerostomia and hyposalivation. Subsequent studies are needed in order to assess the causal relationship between the factors that were associated here with hyposalivation.

Acknowledgment

The authors would like to thank the Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq, National Council for Scientific and Technological Development) for their support in the form of a scientific initiation scholarship.

Collaborators

MSM SOARES contributed to the conception, design and preparation of the study, analysis and interpretation of data and preparation of the paper. RL Cavalcanti supported to the design of the project, data collection and preparation of the paper. LFF Gonçalves supported to data interpretation and preparation of the paper. IO Assis supported to data interpretation and preparation of the paper.

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Received on: 17/5/2020
 Approved on: 31/7/2020